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## EXTERNAL PARASITES ON CERTAIN BIRDS OF BRITISH COLUMBIA.

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During June and July of 1926 while doing marine investigation at Tofino, Clayoquot Sound, on the west coast of Vancouver Island, I had the opportunity of examining certain birds for external parasites. The results from some hosts were so far removed from the normal Mallophagan population of most birds that it seemed worth while recording them at the time.

I am greatly indebted to Professor A. W. Baker, of the Ontario Agricultural College at Guelph and to Professor G. F. Ferris of Leland Stanford University for identifying the Mallophaga and Hippoboscids, respectively, mentioned below.

During the months at Tofino, five Steller's jays, *Cyanocitta stelleri stelleri*, came into my hands at intervals. The first bird, a juvenile, revealed, after a careful search, one very large flea on its head and nothing else. The second jay, also a juvenile, carried a single winged Hippoboscids, *Ornithomyia avicularia*, Linn. and no Mallophaga or fleas on its body. The Mallophaga that I sought on the bird were concentrated on the abdominal tergites of the fly and there were no less than sixteen mature lice tightly wedged together in this area, some at least holding on to the membrane by their mandibles, all with their bodies free so that they looked as if standing on their heads. So tightly were they adhering that when removed with forceps, each one came away with a distinct jerk leaving the intersegmental membrane scarred in places where their mouth parts had been attached. The fly, at least for the time being, was the generous host rather than the bird because, besides the masses of lice, there were some small white mites around and on both the bases of the fly's wings. The mites, at least, had apparently been there for some time because they had laid extensive clusters of oval eggs cemented by little pedicels to one another and to the membrane of the fly's wings.

The lice are *Degeeriella deficiens* Piaget, the same species as others I obtained off jay no. 3. I kept the fly alive for a little while before killing it and neither mites nor lice made efforts to drop off. Concerning this species of louse Professor Baker says "This material appears to be nearer the figures of *Degeeriella ampullata* but Harrison considers this a synonym of *deficiens*. He has had the opportunity of examining much of this European material. The species is recorded from *Cyanopoli* (*Cyanopica*) *cooki*, which is a blue magpie of southern Europe. Only one *Degeeriella* has, with my hurried scanning of the literature, been recorded from a jay in North America, that is *D. vulgata*, Kellog,

\*—Written in September, 1926, at Tofino, B. C. Read before the Annual Meeting of the Entomological Society of Ontario, at Ottawa, November, 1927.

from *Cyanocitta stelleri frontalis*, the blue fronted jay. This material is certainly not *D. vulgata*" which Ferris records from many Passerine birds. This note therefore, constitutes a new North American record and a new host record.

On the third jay, an adult, were some two dozen specimens of this same louse *D. deficiens* Piaget. On the fourth and fifth jays, both juveniles, I could find nothing although both birds were kept as usual for two days wrapped in paper bags and were examined at intervals.

Thus of the five Steller's jays only one, the adult, had Mallophaga on its body and with the exception of the one flea and the one fly, the four juveniles were free from parasites.

Since Hippoboscids are carried in North America mostly by raptorial or cursorial birds, I took two ravens, *Corvus corax*, in the hope of finding additional specimens, but without success. Instead, I obtained very large numbers of the louse *Colpocephalum subaequale* Nitzsch. Both ravens were literally swarming with this louse and after taking over two hundred individuals off one of them, without exhausting the supply by any means, I used both birds for crab bait. Besides those specimens that were put into alcohol, others swarmed out over the wrapping papers and spread in all directions. The sides of the birds under the wings were densely crowded with lice, chiefly in the apterylae. Unless ravens are very insensitive, they must be terribly plagued with vermin if these two specimens furnish any criterion.

In addition to the swarms of *C. subaequale* N., which species is recorded by European and American writers from various species of *Corvus*, including the American raven *Corvus corax sinuatus*, one of my birds furnished two individuals of the louse *Philoaterus ocellatus* Scopoli, which is recorded by European writers from various species of *Corvus*. This constitutes a new host record and a new American record.

Blue herons, that is the northwestern coast herons, *Ardea herodias fannini*, are plentiful in Clayequot Sound. Since one cannot examine herons for lice without handling them, it became necessary to shoot one and a juvenile came within sixty yards of me. The idea of killing the bird was most repugnant but it was getting on in the season and I remembered my experience with Bald-headed Eagles early in June. At that time these majestic birds were plentiful, for as many as seventeen hunted around the bay all one forenoon, but I could not bring myself to shoot one. Finally, when I had hardened my heart sufficiently in the cause of Mallophagan and Hippoboscidian science—there was not an eagle to be seen. So when this heron arrived, I took no further chances but even the bullet disliked its mission because it dropped low and forced me to chase a bird with one broken leg up and down the coast line for an hour before I could get near enough for a killing shot. The only consolation to be derived from the murder, was the satisfaction of the first shot which was really good marksman-ship and I now feel qualified to challenge any entomologist to hit a 2-foot rod, one half inch thick, at 60 yards, with a .22 rifle.

After the massacre, not a single louse could I find on the bird even after keeping it wrapped in paper for two days. So the body was used for crab bait

while wings and head were kept four days longer in paper. By this time they were crawling with maggots so I anchored them on the beach with small stones when the tide was out to enable shore crabs to clean off the bones. In two days I took them up and found on the tips and edges of the wings coverts, seven specimens of the louse *Esthiopterum ardeae* Linn. (*Lipeurus leucopygus* N.), some of which were still alive after having been subjected to four high-tide immersions. Now herons do not immerse their bodies under water and even their heads are rarely below the surface and then only for an instant in the act of catching a fish, so that the ability of these lice to stand submersion for long periods is remarkable; in this case four periods of seven and one half hours each or a total of thirty hours. Moreover, this made a total of eight days that these insects lived after their host was killed. Some would have lived even longer if I had not preserved them in alcohol.

Concerning these lice, Professor Baker tells me that "these specimens are a little larger than the European descriptions and lack some of the bristles on the clypeal margin figured by Giebel, but are undoubtedly the same species. They are recorded by European writers from various species of *Ardea*."

This constitutes a new host record and a new North American record.

Five Brandt's cormorants or shags, *Phalacrocorax penicillatus*, fell into my hands at one time and although examined at once and several times afterwards, not a single bird louse could be found on them. Instead, the five birds yielded twenty four large and small ticks, taken, with one exception, from the head and neck; the one exception was on the upper part of the breast. Most of the ticks were from one-twelfth to one-eighth of an inch, but one measured one-quarter inch in length. Although ticks are mostly parasites of land animals they have been recorded from birds in the Veterinary Surgeon's reports from the Dominion Experimental Farm at Agassiz. Cormorants spend most of their time on the edge of or on sea water and sometimes dive very deeply under it. Thus I have one record of a shag taken from a crab trap four fathoms deep and another from one trap ten fathoms, that is sixty feet deep at high tide on the day in question. The difference between highest and lowest tide at that period was only eight feet, so at the very least, that cormorant went fifty two feet deep, and in order to get into the trap it must have been skimming along the bottom. All of this means that ticks as well as heron lice and probably lice on marine birds, can stand submersion for long periods. In the case of Mallophaga it is perhaps not so surprising, because they would be protected by feathers, but ticks are fat creatures and large ones project out beyond the short feathers on a bird's head and neck.

Blue pigeons, the band-tailed pigeons of the west coast, *Columba fasciata fasciata*, form small flocks during August of anywhere up to forty birds in a flock; they fly from point to point at fairly regular hours every day in order to feed on the seeds of cascara trees. Upon examining several of these birds I found two species of lice, both fairly plentiful. One was *Esthiopterum columbae* Linne (*Lipeurus baculus* N.), the common species which infests wild and domestic pigeons and doves practically everywhere; its presence on this bird, however,

constitutes a new host record. The other species, *Goniodes piageti* Johnson and Harrison (*G. minor* of Piaget) is recorded from Columba species, including the domestic pigeon of Europe. In this instance it is a new North American record and a new host record.

In view of what I had written in this paper in September of 1926, it was of great interest to me to read an article by H. E. Ewing on "The Hippoboscoid Fly *Ornithomyia avicularia* Linnaeus as a carrier of Mallophaga," published in the Annals of the Entomological Society of America for June, 1927.

The pertinent substance of Ewing's article is as follows:

Nine records are cited of Mallophagan infestation of *O. avicularia* Linnaeus.

In records of Hippoboscids carrying Mallophaga, eight out of the eleven known cases are of this one host-species of fly; two cases are synonyms of this same fly; one case only is definitely that of another bird fly. Other more commonly occurring flies have not been recorded as carriers of Mallophaga.

Seven widely occurring species of birds are detailed as carriers of *O. avicularia* L.

While the one Hippoboscoid is almost the sole carrier of Mallophaga, several species of lice are involved and six out of the seven determined species belong to genus *Degeeriella*, while the seventh species belongs to genus *Philopterus*, a genus never separated from *Degeeriella* by any clear-cut generic character.

In the matter of numbers of attached lice, one case is of "several specimens," five cases are of one louse each and three cases are of two lice each, per fly.

The article concludes with a discussion of suggested reasons for this association of Mallophaga and *O. avicularia*.

My findings add another page to this interesting chapter.

We have here the same fly *O. avicularia*, but carrying this time no less than sixteen specimens of the louse genus in question, *Degeeriella*, but of the species *deficiens* Piaget, on yet another bird host to those mentioned by Ewing, namely *Cyanocitta stelleri stelleri*, all the lice being in one group on the dorsum of the abdomen.

In an analysis of Ewing's suggestions as to the reasons for this association, it would seem that the matter of transportation can be discarded since that suggests consciousness on the part of the bird-louse, whereas it should be considered a felicitous result of some other stimulus. The question of the lice attempting to obtain some of the blood that the flies have imbibed from their bird host seems to me doubtful because to accomplish this the Mallophagan mouth parts would have to penetrate deep enough to pierce the alimentary canal of the fly—a feat they cannot accomplish. Ewing's final suggestion, that of an odour or secretion given off by the fly, being attractive to the lice, seems the most reasonable and I suspect that the association is the result of a chemical stimulus supplied by the fly which can only be explained by further investigation of this subject.



THE EARLY STAGES OF *DIAMESA* (*PSILODIAMES*) *LURIDA*\*  
GARRETT (DIPTERA, CHIRONOMIDAE).

BY L. G. SAUNDERS,

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This species was described by Garrett (1925) from a single female taken at Cranbrook, B. C. The description of the male was added by Johannsen (1926) from specimens (1 ♂, 2 ♀) collected in Yellowstone Park. The life-cycle is now completed from material taken in S. E. Alaska in 1926.

The small but conspicuous black larvae were found clinging to granite boulders at the splash-line in a snow-fed mountain stream 10-20 feet above sea level, three miles south of Juneau. Pupae were taken in the same position, each in a mass of jelly after the manner of *Metriocnemus* spp.

## LARVA.

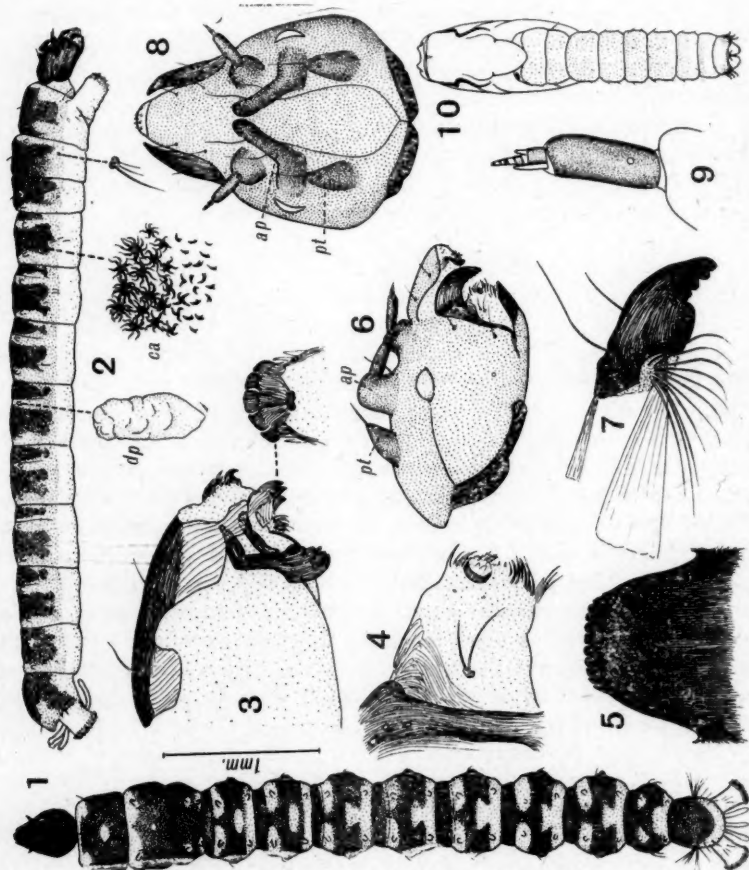
The larvae are slender, cylindrical, 4.7 mm. long when full-grown. Apneustic. Colour black dorsally with distinct colour pattern, pale on venter.

*Head* (Figs. 6, 8) black, dark even when cleared in potash, affixed at a slight downward angle to the axis of the body. On the vertex a pair of prominent, bluntly conical tubercles (*pt*) bearing short apical setae and a sub-apical sensory pit. Directly in front of these tubercles a pair of large processes (*ap*), which at first are directed inwards and then are continued forwards above the surface of the head in cylindrical form, usually meeting at their extremities. These devoid of hairs or pits but two pairs of hairs on the head beneath often appear to arise from them. *Antennae* in front of the anterior dorsal processes, situated on prominent evaginations of the head capsule, composed of a cylindrical basal segment (Fig. 9) with three circular sensory pits on different sides, and a five-segmented flagellum in which the distal segments are reduced to little more than rings; a single Lauterborn's organ beside the flagellum, reaching to third segment; a single minute hyaline peg at end of 2 beside 3. *Eyes* latero-dorsal, rounded, transparent areas with the usual black pigment beneath, which does not show, however, in the living larva on account of the general blackness of the head.

*Mouth-parts*: the anterior dorsal part of the head, the "labrum" of nematocerous larvae, is continued forward until its length almost equals its width at the base. At its extremity a membranous lobe bears numerous sensory processes regularly arranged. Lower down on the anterior extremity are five chisel-shaped chitinous projections with a tuft of setae beneath them (Fig. 3); thence the lower membranous wall slopes back to form the roof of the mouth, supported by two narrow ribbons of chitin. At the sides of the labrum the usual *Premandibles* occur, expanding at their lower extremities into broad 6-toothed plates. *Mandibles* (Fig. 7) stout and strong, with four rounded teeth on the inner biting surface and a fan-like group of 11 chaetae on the base; they function neither vertically nor horizontally but in a diagonal plane. *Maxillae* (Fig. 4) small membranous lobes with very short cylindrical palps and many hairs and chaetae. *Labium* (Fig. 5) a chitinous plate beneath the mouth projecting up at an angle of 45° from the ventral surface of the head. It bears about ten square teeth in a straight row across the end, none down the sides. *Hypopharynx* poorly developed, consisting

\*—Since the preparation of this article the genus *Heptagia* has been erected by Mr. F. N. Edwards to accommodate this species and others discovered in Europe during the summer of 1928. L. G. S.

of a pair of spiny lobes lying above the labium receiving the salivary duct. Behind these a pair of very delicate chitinous rods extending upwards and another pair backwards along the walls of the pharynx.



*Diamesa (Psilodiamesa) lurida* Early Stages.

Fig. 1. Larva, entire, dorsal view. Fig. 2. Larva, entire, lateral view. Fig. 3. Labrum, lateral view. Fig. 4. Maxilla, lateral view. Fig. 5. Labium, lateral view. Fig. 6. Head, lateral view. Fig. 7. Mandible. Fig. 8. Head, dorsal view. Fig. 9. Antenna. Fig. 10. Pupa, entire, dorsal view. *ap*, anterior process; *ca*, cuticular armature; *dp*, dorsal respiratory papilla; *pt*, posterior tubercle.

**Body:** venter colourless, dorsum of each segment with a definite colour pattern resulting from the cuticular armature, which consists of minute hooks of dark chitin imparting a greyish colour. In restricted areas the hooks are developed into complex nearly black processes with a stout base and numerous radiating apical setae, each interlocking with its neighbours and giving a black appearance to the segment (Fig. 2, *ca*). Short, soft, protrusible papillae, apparently respiratory blood-gills (Fig. 2, *dp*), are found on the dorsum of the body arranged in the following order: prothorax none, mesothorax one anterior pair, metathorax

one posterior pair, abdomen one anterior and one posterior pair on all segments except the last. The normal anal blood-gills are cylindrical, scarcely tapering, of medium length; three usually extend backwards and one forwards between the anal pseudopods. Apart from the microchaetae (of which an especially stout pair occur on the dorsum of the metathorax) the only hairs of the body are a tuft of six strong curving setae without basal tubercle on either side of the anal segment. *Prothoracic Pseudopod* bilobed but not deeply incised, its extremity bearing numerous microscopic hooks increasing in size distally to longer slender hooks. It extends to a point beneath half the length of the head. *Anal Pseudopods* widely separated at their bases, shorter than their segment, and terminate in a crown of golden hooks consisting of three complete circles.

## PUPA.

The pupa shows very few characters of any distinction. Thoracic respiratory horns are completely lacking. The abdominal tergites are faintly brown, feebly shagreened, with no posterior row of hooklets. The last abdominal segment has narrow flattened lateral projections each bearing three strong hook-like hairs (Fig. 10). Pupation occurs in a mass of jelly.

Described from 8 larvae and 3 pupae, Juneau, Alaska, 5 VII. 26.

## DISCUSSION.

Potthast (1915) has described the larvae of three species of *Diamesa* and the pupae of five, and Johannsen (1905) two species in both stages. In all these there is a general conformity to Chironomid characteristics and a uniformity *inter se*. What, then, are we to say when confronted with a "*Diamesa*" larva exhibiting such extraordinary modifications as the two pairs of frontal processes on the head, the dorsal respiratory papillae of the body, the three-ringed crown of hooks on the anal pseudopods, the stellate cuticular armature, of *lurida*? Systematic workers with Chironomid larvae are accustomed to seek minute morphological details to establish relationships and specific differences. The characters distinguishing *Diamesa* larvae are (1) the absence of setigerous tubercles on the anal segment, four strong chaetae and a small fifth arising directly from the segment; or in a few cases a pair of short broad tubercles with posterior hook-like projections, bearing five moderately strong chaetae and two others very small. (2) The antennae have two Lauterborn's organs, and only one peg-like sensory organ on the side of the first flagellar segment. (3) The premandibles have seven stumpy teeth. (4) The maxillae are simple, with very short ring-like palps and many hairs. (5) The labium has a median tooth and nine pairs of lateral teeth reducing in size, crescentic in arrangement. (6) The claws of the prothoracic pseudopod are stronger and darker than in other Orthocladariae. (7) The anal pseudopods furnish no distinguishing characters.

Now it will be seen that *lurida* larvae show some similarity to other *Diamesa* larvae in the following particulars. (1) The absence of the setigerous tubercles on the anal segment (a loss which appears frequently in the Chironomidae), but the number of chaetae in their place is greater. (2) The antennae resemble the *Diamesa* type in having only one sensory peg on the first flagellar segment, but have only one Lauterborn's organ. (3) The premandibles have six rounded teeth instead of seven. (4) The maxillae are very similar. (5) The labium is not at

all similar, a most unusual type. (6) The claws of the prothoracic pseudopod are light, small, not darker than other Chironomids. (7) The anal pseudopods are very different, unique.

The pupae of *Diamesa* spp. all have slender thoracic respiratory horns. The abdominal segments are provided with a posterior row of strongly outstanding hooklets or "thorns" besides the usual shagreening, and the last segment has lateral flanges with three long chaetae very slightly curved. In *lurida* there are no prothoracic horns, no posterior row of "thorns" on the abdominal segments, and the flanges of the last abdominal segment bear three short hooked chaetae. Furthermore all *Diamesa* pupae are recorded as free, while *lurida* secretes an envelope of jelly.

The habits of all forms are very similar, all *Diamesa* species having been recorded from swiftly flowing streams of pure water in mountains or plains. The remarkable morphological features of *lurida* cannot, therefore, be attributed to the influence of peculiar conditions of life.

It will be seen, therefore, that there are abundant reasons for a marked separation of *lurida* from the other species of *Diamesa*, and in fact from all other Chironomids, if any weight is given to larval characters. But in view of the similarity of the adults the species will remain in Kieffer's subgenus *Psilodiamesa* pending an extension of our knowledge of the early stages of this group. There are several other subgenera of *Diamesa* and in none of them are the larvae known.

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## THE SYSTEMATIC STATUS OF THE MINT FLEA BEETLE (CHRYSom., COLEOP.), WITH ADDITIONAL NOTES.

BY L. G. GENTNER,  
East Lansing, Michigan.

### *Longitarsus waterhousei* Kutschera.

- Wien. Ent. Monatschr., VIII, p. 274, 1864, Sep. 295.  
*Longitarsus menthae* (Bedel)—Faune Col. Bassin Seine, V, p. 189 and 306, 1898.  
*Longitarsus menthae* Gentner—Mich. Agr. Exp. Sta. Quar. Bul., 7, No. 3, p. 109, Feb. 1925.  
*Longitarsus menthaphagus* Gentner—Can. Ent. LVIII, No. 6, pp. 152-153, June, 1926.

Some interesting developments recently have taken place with reference to the systematic status and distribution of the mint flea beetle, as we know it in America, which tend to clear up the origin of the pest in this country.

The matter was precipitated by a visit to England in November and December, 1927, by Mr. Richard Stroud, Assistant Superintendent of the mint plantation of the A. M. Todd Company, at Mentha, Michigan. Mr. Stroud, who had formerly grown mint in England, wished to determine whether or not the mint flea beetle was to be found in English mint fields, so he asked me to prepare a life history mount of this insect, which he might show to English mint growers. While in London, he visited the British Museum and showed the mount to Major E. E. Austen, in charge, who immediately set his men to work to see whether



any similar insects could be found in the collection. They finally found two specimens of *Longitarsus waterhousei* which they thought agreed quite well with the American specimens. These had been collected by Waterhouse in about 1860, and had been sent to Kutchera of Germany who described them under that name. At a later date Mr. Stroud visited some of the mint fields in order to make a search for the flea beetle. The mint crop has been cut for some time and a good second growth was present. In some of the older fields at Holbeach, feeding injury was quite apparent on the leaves, and by careful searching beneath the plants he found 25 live beetles over an area of about 4 feet square. Such an infestation could readily be the cause of low yields in these mint fields. Mr. Stroud wrote me in part as follows: "Mitcham, the home of the industry, is almost a dead issue and Market Deeping, where I once held fort, is as dead as the proverbial mutton. In fact it sickened me when I visited the latter place to find that even the fine old copper stills had been torn out and sold for junk and the distillery dismantled. And now I think our old friend (the mint flea beetle) has been the prime cause of the downfall of the industry."

Mr. Stroud sent me seven of the specimens and sent the remainder of the series to the British Museum. The specimens agree very well with our American specimens, except that the series averages a little larger, and only two of the five females are fully winged. The other three show only a feeble development of the membraneous wings. All of the females taken in this country have been fully winged. The males in both series are apterous. A comparison of the male genitalia of specimens of both series showed these to be identical. Length of English specimens—males, 2.25 to 2.35 mm.; females, 2.37 to 2.63 mm. Length of American specimens—males, 1.75 to 2.25 mm.; females, 2.0 to 2.6 mm. A larger series of English specimens no doubt would show greater variation.

In order to establish conclusively the true standing of the mint flea beetle, I sent Michigan specimens to Major Austen of the British Museum, who referred them to Mr. K. G. Blair. I also sent some to Dr. Franz Heikertinger of Austria, who is an authority on European Halticinae. Mr. Blair wrote me that though the British series ran a little larger than the American, he believed them to be conspecific. Dr. Heikertinger wrote that he had compared the American with the European series and had found them to be identical even to the male genitalia. He also stated that it is the first species of *Longitarsus* common to both America and Europe, and that it is relatively rare in continental Europe. He kindly sent me a specimen of *L. waterhousei* taken in Austria on *Mentha crispa*. It seems definitely established that *L. menthaphagus* Gentner should stand as a synonym of *L. waterhousei* Kutsch. which latter name has priority.

Dr. Heikertinger discusses the European synonymy in a paper published in 1921. In 1864, F. Kutschera of Germany, first described this insect as *L. waterhousei* from specimens collected in England by Waterhouse. In 1898, Bedel described it from France as *Thyamis menthae*.

The name *L. menthae* Gentner was established by the unfortunate use of a drawing of the male in an economic article<sup>2</sup> published in February, 1925. In

- 1.—Systematik und Nomenklatur der palaarktischen Halticinen—Entomologische Blätter, Internat. Monatschr. für Biol. und Syst. der Käfer, etc., Heft 2, pp. 43-44, 1912.
- 2.—The Mint Flea Beetle—Mich. Agr. Exp. Sta. Quar. Bul. 7, No. 3, p. 109, Feb., 1925.

May, 1925 Dr. Heikertinger advised me that the name *L. menthae* already had been used by Bedel for a European species and that I should change the name of the American species. He had some of the Michigan examples at that time, but because of the press of work, and the facts that *L. menthae* Bedel was relatively rare in Europe and no species of *Longitarsus* then known to him was common to both America and Europe, he failed to make comparisons. Therefore, in 1926<sup>3</sup> I changed the name to *L. menthaphagus* and published a description.

It is now quite certain that the mint flea beetle was originally introduced into this country on mint roots brought over from England because of the higher yield of oil to be obtained from the English mint over that of American mint. Roots were brought into this country by various growers as early as in the 1870's. They were usually shipped in the spring and it is quite possible that eggs or even young larvae may have been brought over with them.

In continental Europe the flea beetle is reported as relatively scarce, and it occurs in semi-moist situations. Dr. Heikertinger<sup>4</sup> records it from the following host plants: *Mentha aquatica*, *M. parietariaefolia*, *M. arvensis*, *M. crispa* (cult.), and *M. candicans*.

In England it seems to be quite abundant and no doubt has been causing serious losses to the mint industry and a gradual decline, unknown to the mint growers, who have been laying the blame to various other causes.

In North America it is known to occur only in Michigan and Indiana, where it has been known to feed on no other plants than those belonging to the mint family. In Michigan it probably occurs wherever mint grows and undoubtedly has been carried from this state into Indiana, where it is spreading rapidly. A careful study of the situation has led me to believe that this insect is by far the most important factor which is concerned with the reduction of oil yields and the limitation of the period during which mint may be "kept in the ground" profitably in these states, however, losses may be held at a minimum by the diligent use of control measures.<sup>5</sup>

It is not known whether this insect occurs in the mint fields of New York, nor has it been recorded from the newer mint districts of Oregon. Within the past few years mint roots have been shipped in carload lots from infested districts of Michigan to California but so far the insect has not been found there. It is very important that all possible precautions be taken in the transporting of mint roots to prevent the introduction of such a serious pest into new areas.

#### NOTES ON CANADIAN DIURNAL LEPIDOPTERA.\*

BY J. MCDUNNOUGH,

Ottawa, Ont.

#### *Pieris beckeri* Edw.

Judging by five specimens before me the early spring generation (April-May) from southern British Columbia shows several points of distinction from

3.—New N. Amer. Horticinæ, etc.—Can. Ent., LVIII, No. 6, pp. 152-153.

4.—Resultate Fünfzehnjähriger Untersuchungen über die Nahrungsplanzen Einheimischer Horticinen—Entomologische Blätter 22, Heft 1, p. 5, 1926.

5.—Gentner—The Mint Flea Beetle, Mich. Exp. Sta. Spec. Bul. No. 155, 1926.

\*—Contribution from the Division of Systematic Entomology, Entomological Branch, Dept. of Agric., Ottawa.

the second generation, appearing in the latter half of June. The size is notably smaller, ( $\delta$  36-40 mm.;  $\eta$  40-42 mm.; as compared with 45-50 mm.), the discal spot of primaries, especially in the  $\delta$ , is much narrower, and more as in the European *chloridice*, and the green of the underside is brighter and even along the veins shows only faint yellow sprinkling. Edwards' figures of the types from Nevada, although taken from specimens caught in April and therefore probably of the first brood, are very close to the June specimens from British Columbia and it may be that in southern localities the differences between the broods are not so obvious; however, our British Columbian early specimens seem worthy of a name and I would propose for these *PSEUDOCHLORIDICE*, the types as follows:

*Holotype*.— $\delta$ , Oliver, B. C., April 24 (C. B. Garrett); No. 2861 in the Canadian National Collection, Ottawa.

*Allotype*.— $\eta$ , Oliver, B. C., April 22, (C. B. Garrett).

*Paratypes*.—1  $\delta$ , Hedley, B. C., May 15, (W. B. Anderson); 1  $\delta$ , Osoyoos, B. C., (C. deB. Green); 1  $\eta$ , Osoyoos, B. C., (C. deB. Green).

#### *Pieris sisymbrii* Bdv.

In their recently published "Check List of Diurnal Lepidoptera" (1926, Bull. S. Calif. Acad. Sci., XXV, 6) Barnes and Benjamin place *flavitincta* Comst. in the synonymy of ab.  $\eta$  *flava* Edw. This latter name was proposed in the "Butterflies of North America I, Pieris, I," for a yellow  $\eta$  and a figure of the type given. No locality is mentioned for this specimen, the text merely stating that the species occurs in "North and South California, in Nevada, in Southern Colorado and in Arizona," but, judging by the figure, the form represented is the typical one with lightly marked underside of secondaries such as is found in the southern portion of the range of the species. *Flavitincta*, on the other hand, was described from a  $\eta$  specimen from Cranbrook, B. C. (1924, Bull. S. Calif. Acad. Sci. XXIII, 19, Pl. VII, fig. 9), and the author notes that this specimen "is perhaps a little more heavily marked than examples taken in California due to its boreal habitat. Edwards' figure shows less of the grey sprinkling." I heartily concur with this remark and might add that in British Columbia the yellow  $\eta$  seems to be the normal form, as out of a series of twelve females before me only one is white. In 1926 (Bull. S. Calif. Acad. Sci., XXV, 88) Barnes and Benjamin describe as race *clivata* a form from Glenwood Springs, Colo. which differs from the typical one "by the heavier black powdering striating the veins on the underside of the secondaries." A  $\delta$  and a  $\eta$  paratype of *clivata* are before me, due to the kindness of the authors, and except that the  $\eta$  is white I cannot differentiate these from our British Columbia specimens; a  $\delta$  and two yellow females from Laggan, Alta, and two males and a white  $\eta$  from the Great Slave Lake region, Alta. in the Canadian National Collection obviously belong to this same form, being, indeed, even more heavily powdered along the veins than the Glenwood Springs paratypes. Should the Canadian and Coloradan specimens be considered as belonging to a single race then according to the International Rules the name *flavitincta* Comst. must be applied to it with *clivata* as a synonym, even though the name originally was based on a color form of the  $\eta$ . Possibly the best way out of the muddle for the present is to restrict the name *clivata* to the Coloradan race with normally yellow  $\eta$  and give *flavitincta* racial status

for a Canadian race with normally yellow ♀ but occasional white ones. *Flava* Edw., if it be considered to have any status at all, in view of the fact that a similarly named aberration of *napi* has priority, must apply to the yellow ♀ of the typical race from southern California and Arizona.

***Pieris napi* Linn.**

On several occasions (1916, Contr. III, 57; 1918, *op. cit.* IV, 63) I have discussed the various races of this species without any very special reference to our Canadian forms, and in my notes on Labrador Lepidoptera (1921, Can. Ent. LIII, 81) I have commented on *napi frigida* Scud., of which race I considered *borealis* Grt. a synonym. I note that Barnes and Benjamin in their latest list retain both these names for races, no reasons being stated for their action, but after a study of a series from Labrador, covering a period of several years' collecting, I cannot see any likelihood of more than one race occurring in this general region. The males are not very different from those of *napi oleracea* Harr., as taken around Ottawa, being perhaps slightly more yellow (in fresh specimens) on the underside of secondaries and with rather more pronounced dark veining. The females, however, are more easily separated and are rather variable; they all show more smoky suffusion on the upper side than in *oleracea* ♀ with a tendency for the veins in the apical half of primaries to be dusted with blackish; this suffusion is increased in certain individuals until the result is a *bryoniae*-like form very similar to the females of *napi arctica* Verity, with the two submarginal black spots of primaries distinctly present. While it is scarcely likely that more than a single generation occurs in Labrador it is worthy of note that the darker females were all captured in the latter half of June 1924, whilst the paler forms were taken in the first half of July, 1918; in the respective males no differences are evident; Edwards' figure (Pap. I, Pl. II, fig. 4) is a good representation of the darker ♀ form, the paler one being depicted in the Barnes and McDunnough "Contributions" (Vol. III, Pl. VII, fig. 2); the underside of the ♂ is represented by figure 9 of Edwards' article, as *borealis*, evidently drawn from topotypical material.

*Napi oleracea* Harr. is the race typical of the Canadian zone and extends across the Dominion, following the tree-belt, to at least the eastern foothills of the Rockies. In neither sex are black subterminal spots on the primaries normally present in our series, only one ♀ of the summer form from the Forks of the Credit, Toronto, Ont., showing traces of same; small series of both sexes from Aweme and Miniota, Man.; Edmonton, Nordegg, and Calgary, Alta., as well as from the Great Slave Lake region, N. W. T. are before me and these western and northern specimens cannot be separated from a long series from the Ottawa region. The Nordegg specimens were taken by myself at odd times during June and July in larch swamps at low altitudes, the species being probably single-brooded in this region. Comstock's figure of *oleracea* ♂ in the "Butterflies of California" (Pl. IX, fig. 9) from Piguitenay River, Man. looks suspiciously like a ♀ and his fig. 12 is certainly not that of a normal ♀, being much closer to females from Vancouver island and southern British Columbia which are generally designated as *napi marginalis* Scud.

In the southern portion of the Alberta foothills *oleracea* seems to intergrade into the *marginalis* form which in the ♀ shows a dark suffusion along the



inner margin of primaries and the two dark subterminal spots; on the underside of secondaries the dark veining is not clean-cut but rather suffused, tending at times to broaden, especially along the outer margin. This form is apparently the only one at Waterton Lakes and Crow's Nest Pass region but in Wolley-Dod's material from the vicinity of Calgary both forms occur (although possibly not in exactly the same locations) and it was probably these *marginalis* specimens which led Edwards to record *virginiensis* from Alberta (Can. Ent. XXXIII, 168). In certain Banff specimens before me, taken in late May and early June, the suffusion of the underside has been carried to such an extent as to render the ♂, at least, scarcely distinguishable from the Arctic form *pseudobryoniae* Verity. I have seen no specimens of the summer form of *marginalis* from Alberta and it seems probably that the species is normally single-brooded in this region. Blackmore in his "Check List of British Columbia Lepidoptera" records *napi marginalis* from central and southern British Columbia as well as from the Kootenays, so that in all likelihood it has spread into Alberta through the low southern passes, joining up with *oleracea*, coming down from the north, somewhere about the Calgary region. Bowman, in his "Alberta Check List" records *pseudonapi* B. and McD. from Blairmore (Crow's Nest), possibly following my tentative determination; I now think that it would be better to apply the name *marginalis* to these specimens as the females are hardly typical of *pseudonapi* from high altitudes in southern Colorado.

#### ***Anthocharis sara* Bdv.**

Blackmore, in his "Check List of British Columbia Lepidoptera" (p. 7), lists *sara* f. *reakirtii* Edw. from S. Vancouver island and the Lower Fraser valley, British Columbia. To my mind the form occurring in these regions is *flora* Wgt.; the types of this so-called race came from Tenino, Wash. and are well figured as figs. 65 and 65b, Plate VIII in the "Butterflies of the West Coast." As a matter of fact *reakirtii* and *flora* are extremely close to each other, both showing heavy black spotting along the outer margin of secondaries; the females of *flora* are generally yellower and the orange tip of the ♂ slightly broader, leaving a narrower apical black area, but neither of these features is entirely constant and at times I must confess that the locality label is all that guides me in placing individual specimens. The name *flora* may be used for the coast form from Washington and southern British Columbia leaving *reakirtii* for the spring generation from California.

The form with somewhat reduced black suffusion found in the interior of British Columbia, which Blackmore apparently calls *flora*, I am placing under *stella* Edw. It is true that in the original description Edwards mentions the yellow color of both sexes but this is probably inconstant and, as I have already noted (1916, Contr. III, 62), the series of *stella* in the Edwards' Collection shows both yellow and white males. The typical locality for *stella* is the Yosemite valley, Calif. but it would seem to occur in suitable locations all through the Sierras and Coast Range as far north as British Columbia. Further I cannot separate small specimens from British Columbia from *julia* Edw. as figured in his "Butterflies of North America II, Anth. II," especially specimens occurring at higher altitudes; the curvature of the black inner margin of the orange tip, mentioned by Edwards as a good character, seems individual rather than racial:

as, however, *julia* was based on Colorado specimens from high elevations, and as my material from this region is very worn and scanty I would for the present leave the name *julia* for a doubtfully distinct Coloradan race. In any case the name has priority over *stella*. Bowman in his Alberta List records *julia* from Blairmore; my Waterton specimens, which are probably identical with those from Blairmore, cannot be differentiated from the British Columbian ones I call *stella* and the species has probably established itself in this region through infiltration along the low passes of the Rockies, just as was the case with *P. napi marginalis*.

### **Eurymus emilia Edw.**

After a study of our long series in the Canadian National Collection I incline very much to the view that *emilia* must be considered to be merely a yellow race of *christina*. Typical *christina*, with its deep orange ♂, extends from northern Alberta down along the eastern foothills of the Rockies into the prairie regions of Saskatchewan; in southern Alberta (Waterton) along with such typical specimens we find many others with reduced orange areas (*astraea* Edw.) and occasional males in which all traces of orange have disappeared, except for a few marks along the veins. At points such as Banff, Laggan and Jasper Park the species has penetrated into the Rockies for a short distance but I know of no records of its occurrence in the valleys of southern British Columbia. On the other hand in favorable spots *emilia* is quite abundant in this region and some of our Osoyoos specimens show as distinct orange tinges as are found in the above mentioned Waterton ones; in specimens where all orange has disappeared there is still noticeable the deepening of the yellow color on the secondaries between the discal spot and the black marginal band and this feature at once separates *emilia* males from those of *gigantea* which Barnes and Benjamin still list as a form of *christina* but which I believe distinct on the strength of different food-plants (*vide* Can. Ent. 1922, LIV, 135). I have no record of the food-plant of *emilia* but it is quite likely to be a species of lupine as at Anderson Lake where I collected a long series in 1926, the slopes which it frequented were covered with this plant. Whether *alexandra* Edw. is a further variant of the same species is a matter on which I do not care to venture an opinion at the present time; Hagen suggested this possibility in his paper on the genus *Colias* (Proc. Bost. Soc. N. H., XXII, 156) and there is considerable ground for his contention; the larval food-plant is given as *Astragalus* which is closely allied to the food-plant of *christina*; apart from the heavier sprinkling of dark scales on the underside of the secondaries and the lack of the pink border to the discal spot *alexandra* is certainly very close to *emilia*.

### **Eurymus nastes Bdv.**

In his original description Boisduval gives the North Cape, Iceland and Labrador as type localities for this species; the northern Scandinavian race having been named *werdandi* by Zetterstedt in 1840, subsequent authors have been unanimous in considering the Labrador race to be the typical one, the rather crude colored figure fitting in better with Labrador specimens than with the paler European ones.

Typical *nastes* is well figured by Edwards (Butterflies of North America, II, Col. I) and by Holland; the males are characterized by the rather bright

yellow-green color of upperside with sparse black sprinkling and with more or less the same color on the underside of secondaries; the females vary from pale yellow-green to whitish and the underside of secondaries is duller.

As far as color goes the race *streckeri* Gr. Gr. from high elevations in the Canadian Rockies and Coast Range is very similar but in general in the ♂ the discal spot on primaries is larger and pale-centered and the pale submarginal spots in the black border less distinctly defined, the females are generally pale yellow and the underside of both sexes tends to a duller yellow-green. Verity has described as ab. *obscurata* (Rhop. Pal., Pl. LXXI, fig. 6) a ♂ from Lake Louise in which the primaries are heavily suffused with black; while there is no doubt that Verity's type is a very extreme form, my own collecting experience shows that such suffused specimens occur in both sexes in the highest altitudes in the Banff region and become the prevailing form further north (Nordegg, Jasper Park, Alta.). I think therefore it would be advisable to apply Verity's name in a broader sense as form, or var., *obscurata* for all specimens in which the primaries in the ♂ are very largely and in the ♀ quite considerably suffused with black.

*Moina* Stkr., of which the Barnes and Benjamin List makes *cocandicides* Verity a synonym (and rightly so in my opinion), is another small pale form with very bright green underside of secondaries. It occurs in the Barren Grounds, N. W. T., but, as there is only a single ♂ specimen from Cariboo Crossing, Great Slave Lake region in our collection, I cannot comment on the value of the name from a racial standpoint. *Rossi* Gn. is a rare form or race with pale orange suffusion on the upper side: there is a single specimen from Pond's Inlet, Baffin Land before me, which would indicate an extremely northern distribution.

Corresponding to the form *obscurata* of *streckeri* a very similar dark form is the dominant one along the northern coast; in the long series brought back by the Canadian Arctic Expedition from Bernard Harbor only one or two specimens at all approach the Labrador *nastes* in coloration of upper side; the males are heavily suffused with black on the primaries with the submarginal row of pale spots generally well developed; the secondaries show much less of the black suffusion. On the underside the secondaries are also suffused, the color of the entire disk being a dark smoky green with a paler terminal band which at times contrasts very sharply with the remainder of the ground-color. The females show a similar smoky suffusion but it is scarcely so pronounced, there being more or less of a pale yellow-green ground color visible, as well as the similarly colored submarginal spots. On the underside of the secondaries, however, the suffusion is heavy, the entire disk at times being almost blackish with a paler orange-yellow terminal band which, at times, as in the ♂ sex, may stand out sharply. As there seems no name available I propose *SUBARCTICA* for this race with following types:

*Holotype*.—♂, Bernard Harbour, N. W. T., Aug. 9, 1915, (F. Johanssen), No. 2863 in the National Collection, Ottawa.

*Allotype*.—♀, same data.

*Paratypes*.—4 ♂, 4 ♀, from same locality, taken on various dates early in August.

**Coenonympha inornata** Edw.

Through the kindness of Dr. W. J. Holland of the Carnegie Museum I have received photographs of the ♂ and ♀ types of this species described from material from Lake Winnipeg collected by R. Kennicott. A study of these photographs confirms a suspicion I had already in my mind, *viz.* that the recently described race *quebecensis* B. and Benj. (1926, Bull. S. Calif. Acad. Sci., XXV, 89) will fall as a synonym of the typical form.

Kennicott's material was presumably collected on a trip taken with Dr. S. H. Scudder down the Saskatchewan River, through Lake Winnipeg and then by way of the Winnipeg River to the Lake of the Woods. *Inornata* is, therefore, a typical inhabitant of the spruce-belt section of the eastern half of Canada, apparently reaching its southern limits in the Algonquin Park region of Ontario and the lower reaches of the Gatineau River just north of Ottawa; it is found in a scarcely modified form in Newfoundland and extends northward at least as far as the southern shores of James Bay; it is characterized by the rather dark ochreous-brown color of the upper side of the ♂ with distinct (but not constant) tendencies to whitish suffusion along the outer margin of secondaries; on the underside the apex of primaries is broadly and the secondaries almost entirely suffused with pale whitish green and the subapical ocellus of the primaries is either entirely lacking or greatly reduced and indistinct. The type ♂ of *inornata* is (as far as can be judged) entirely without ocellus, whereas a paratype of *quebecensis* before me shows merely a pale round spot with no dark filling and the series of specimens in the Canadian National Collection contains both forms with a very occasional specimen in which a small amount of black is present.

In the prairie region, extending from southern Manitoba to the foothills of the Rocky Mountains, we meet with a somewhat modified race which has very generally been mistaken for *inornata*. In contradistinction to the typical subspecies, however, this race has normally a well-developed ocellus on the underside of primaries apically, consisting of a round black spot with pale centre, surrounded by a ring of pale ochreous; specimens with reduced or even obsolete ocellus do occasionally occur but are distinctly the exception rather than the rule; other specimens show traces of a weak submarginal row of ocelli on the underside of secondaries and very rarely there is a second ocellus on the primaries. The underside of secondaries is somewhat deeper greenish and the basal half shows decidedly more brown tinges than in the type form whilst on the upper side the pale suffusion along the outer margin is practically absent. Skinner's figures of males from Minneapolis, Minn. (Trans. Am. Ent. Soc., XXVI, Pl. VII, figs. 10, 11) evidently represent this race, although in fig. 11 the ocellus is smaller than normal. It was also this race to which I erroneously (1916, Contr. Nat. Hist. Lep. III (2) 71) applied the name *inornata*, having no knowledge at the time of eastern Canadian specimens, and Benjamin has evidently fallen into the same error.

I propose the name *BENJAMINI* for this prairie race of *inornata*, with following types:

*Holotype*.—♂, Waterton Lakes, Alta., June 28, (J. McDunnough), No. 2888 in the Canadian National Collection, Ottawa.

*Allotype*.—♀, same locality, July 1.



*Paratypes*.—6♂, 4♀, same locality and collector, June 28, 30, July 1, 6, 8, 10.

There is also a very long series of specimens before me from Aweme, Man., various localities in Saskatchewan, and Calgary and Nordegg, Alta.

In the far west on the Pacific slope the species has undergone further modification. On Vancouver island we meet with a race with much paler-colored upper side as compared with *inornata* but showing the same tendency to white suffusion around the outer margin; in further contradistinction to both *inornata* and *benjamini* the color of both sexes is very similar and the females at least are not noticeably paler than the males, as is the case with the eastern races. On the underside there is a total lack of the apical ocellus but the general coloration is not very different from that of *inornata*; there is possibly slightly more brown suffusion over the basal half of secondaries and a tendency for the whitish irregular discal band to be more continuous and better developed, but these characters are not constant.

This race, as I pointed out previously (Cont. III (2) 71) has generally gone under the name *ampelos* Edw. and W. H. Edwards himself described its life-history under this name (Can. Ent. XIX, 41) from material received from Dr. Fletcher marking apparently in his collection one of these bred specimens with the word "type." I noted (*l. c.*) that this designation would not hold but could find at the time in the Edwards' Collection neither of the original ♂ and ♀ specimens from Oregon from which the description was drawn up (*vide* Edwards, *l. c.* 43). In rearranging the species of this genus in the Canadian National Collection I have, however, come across an old, worn ♀ from the Geddes' Collection, No. 451 bearing a label in W. H. Edwards' handwriting "*Ampelos* ♀ Edw. Oregon;" this agrees excellently with the original diagnosis, especially in the fact that the underside is nearly the same shade as the upper side and, should the ♂ be actually missing from the Edwards' collection, I believe I am justified in considering this specimen to be the type. I have matched this ♀ with a ♀ from Salem, Oregon before me; while it seems most probable that *ampelos* is merely a racial form of *inornata*, still it may be at once distinguished from the Vancouver island race by the much browner coloration of the underside, especially in the apical area of primaries and the marginal area of secondaries; as Comstock has noted (Butt. Calif. 68) it appears to intergrade with *elko* which is an inhabitant of the more arid regions of eastern Oregon and Nevada.

For the Vancouver island race I propose the name *INSULANA* with types as follows:

*Holotype*.—♂, Victoria, B. C., May 20 (W. Downes); No. 2889 in the Canadian National Collection, Ottawa.

*Allotype*.—♀, same data.

*Paratypes*.—1♂, same data; 1♂, Victoria, B. C.; 3♂, Victoria, B. C., May 21 (W. H. Danby); 1♂, Victoria, B. C., May 3; 1♂, Victoria, B. C., May 9 (W. Downes); 2♂, Royal Oak, B. C., May 26, (R. C. Treherne); 1♂, Royal Oak, B. C., June 12 (W. Downes); 1♀, Victoria, B. C., May 23 (W. Downes); 1♀, Royal Oak, B. C., May 31 (R. C. Treherne).

Finally in the southern interior of British Columbia we meet with a race considerably larger and brighter colored than the Vancouver island one, the ♂

being about the same shade of deep ochre as the ♀ of typical *inornata* and the ♀ only slightly paler. The underside of the primaries is very bright ochre-brown, contrasting strongly in fresh specimens with the gray-green apical section which is without ocellus (in one ♀ I find a small ocellus) normally; the secondaries are paler than in *insulana* but still show more greenish color than in *ampelos*. This race I call *COLUMBIANA* with following types:

*Holotype*.—♂, Aspen Grove, B. C., June 15 (P. N. Vroom); No. 2890 in the Canadian National Collection, Ottawa.

*Allotype*.—♀, Oliver, B. C., June 28 (C. B. Garrett).

*Paratypes*.—♂, Nicola, B. C., May 29 (P. N. Vroom); ♂, Aspen Grove, B. C., June 28 (P. N. Vroom); ♂, Vernon, B. C., May 23; ♂, Hedley, B. C., July 20 (C. B. Garrett); 2♂, Oliver, B. C., May 16, 23, (C. B. Garrett); ♂, Osoyoos, B. C.; ♀, Hedley, B. C., July 27 (C. B. Garrett); ♀, Keremeos, B. C., June 19 (C. B. Garrett); ♀, Oliver, B. C., June 6 (C. B. Garrett).

### ***Brenthis myrina* Cram.**

The type locality for this species is New York and Cramer's figure, although crude, shows distinct rows of orange spots on both wings in the terminal black band. Recently Huard (1926, Le Nat. Can., LIV, 131) has described as a new species, under the name *atrocostalis*, what proves to be, on examination of the type, our eastern Canadian form of *myrina*; the name *atrocostalis* can, I believe, be preserved in a racial sense, for, in a long series before me from the Ottawa and Algonquin Park regions in Ontario and certain localities in southern Quebec, I note that the prevailing tendency is toward an expansion of the marginal black areas and a diminution of the contained orange spots, these frequently becoming obsolescent; on the under side of secondaries the red-brown tends to be deeper in color and more extended. This race apart from size bears the same relation to typical *myrina* that *grandis* B. & McD. does to *chariclea oenone* Scud.

It is probable that in southern Ontario more or less typical *myrina* will be found, *atrocostalis* being confined to the spruce or mixed forest belts; in the prairie provinces and in British Columbia the species again appears to be fairly typical with a tendency in certain specimens, especially ♀, toward the Colorado form *tollandensis* B. & B.

### ***Brenthis freija* Thun.**

In some of the latest works on North American butterflies (*c. g.* Seitz) the name *tarquinius* Curt. has been erroneously applied to British Columbian specimens of *freija*. As a matter of fact *tarquinius* was described from material collected by the Ross Arctic expedition in the neighborhood of Boothia or northern Baffin island; judging by material in the Canadian National Collection from various localities on Baffin island ranging as far north as Pond's Inlet, it is a distinct Arctic race, characterized by the deep mahogany-brown color of the underside of secondaries with few traces of the paler, ochreous shades, the silver markings standing out on the dark background very prominently. The upper side is also much darker than is general in the Rocky Mountain form, and the sub-marginal round black spots are very well developed on both wings. Material from the Labrador coast and the Mackenzie delta region does not vary very markedly from Baffin island specimens but there is a slight increase in the paler

shading on the underside of secondaries and a corresponding diminution of the black shading on the upper side.

***Brenthis polaris* Bdv.**

The name *gronlandica* Skin., based on figures published in the "Entomological News" for 1892 (Pl. II, figs. 9, 10) and considered at the time to be a Greenland race of *chariclea*, should be referred to *polaris*; Skinner himself recognized the error of determination and corrected it in his "Synonymic Catalogue of North American Rhopalocera" (p. 11). The name *gronlandica* Skin. will take priority over *americana* Strand, also based on Greenland material (1905, Rep. 2nd Nor. Arct. Exp. No. 3, p. 10). There is considerable variation in the amount of black suffusion on the upper side (notably in the ♀) and the maculation on the underside of secondaries and I am doubtful whether the distinguishing characters given by Strand for this race will always hold.

REVISION OF THE AMERICAN SPECIES OF ARCHYTAS  
(TACHINIDAE, DIPTERA).\*

BY C. HOWARD CURRAN,

Ottawa, Ont.

(Continued from page 256)

***Archytas incasana* Townsend.**

(Fig. 28)

Proc. U. S. N. M., XLIII, 331, 1912.

Length, 11 to 12 mm. *Male*. Front pale cinereous pollinose the parafrontal hair black; third antennal joint narrowly reddish below; basal arista joint slightly longer than broad, the second elongate. Pleura yellow pilose. Three posterior acrosticals. Abdomen shining black, the sides usually very broadly castaneous, the apical segment pale brassy yellowish pruinose; rather broad apex of first and base of second segments cinereous pollinose. Second abdominal segment with strong marginals. Fifth sternite simple, with moderately strong apical bristles. Ridges of posterior forceps moderately high, flattened, hairy on inner and outer surfaces, the apex as in figure 28; the outer forceps are as in *A. plangens* n. sp. (see figure 27).

Redescribed from three ♂, Peru (Townsend), one of which was compared with the type by Dr. Aldrich; ♂, El Salado, Ecuador, (F. Campos); and ♂, Farm La Caja, San Jose, Costa Rica, Feb.-Apr. 1924; ♂, Yucatan, Mexico, (Gaumer).

There is also a ♀ taken with one of the males at San Diego, Peru, April 7, 1912. The parafrontals are pale ochreous. The second tergite bears a pair of moderately approximated, strong marginals and the pollen on the basal segments is as in the ♂. This latter character serves as a ready means of recognizing the species in the ♀ sex. The type is a ♀. Townsend states that the wings are clear but they are lightly cinereous as in other species.

***Archytas prudens* n. sp.**

(Fig. 28a)

Similar to *incasana* Townsend, from which it differs as follows: Lobes of fifth sternite very broadly rounded, not sharply rounded and sub-parallel on inner side, the ridges of the posterior forceps low.

*Type*, ♂, Yucatan, Mexico (Gaumer).

*Paratype*, ♂, same data.

**Archytas basifulva** Walker.

(Figs. 29, 30)

*Echinomyia basifulva* Walker, List Dipt., IV, 725, 1849.*Jurinia apicifera* Williston, Trans. Ent. Soc. London, 353, 1896.*Archytas basifulva* Coquillett, Proc. U. S. N. M. XXII, 253, 1901.

Differs from *apicifera* in having the thorax duller, more greyish and in the genitalia.

Lobes of fifth sternite with well developed apical arm. Outer forceps with the upper arm much smaller than the lower, but long and narrow. Posterior forceps with the lobes high and very thin (lateral view, figure 30), the median forceps long, shallowly excavated at the apex.

There are specimens before me from Jamaica, Cuba, Haiti, Costa Rica, Canal Zone, British Guiana, Colombia and Peru. A paratype of *A. analis andina* Townsend is also before me.

**Archytas productus** n. sp.

This species agrees in almost all respects with *A. basifulva* Walker but is readily distinguished by the brownish squamae in both sexes. The fifth sternite of the ♂ is almost as in *basifulva* and the ridges of the posterior forceps are unusually high and thin as in that species. The pollen on the fifth abdominal segment of the male is tawny brown but is more yellowish laterally in the ♀.

*Holotype*—♂, Chosica, Peru, April 30, 3000 ft., (C. H. T. Townsend), in United States National Museum.

*Allotype*—♀, same locality, Nov. 7, 1913 (Townsend).

*Paratypes*—♂ 4 ♀, Posorja, Ecuador, Campos (from the Aldrich Collection). Paratypes, No. 2822 in the Canadian National Collection, Ottawa.

This may eventually prove to be only a variety of *basifulva* Walker but the material before me contains no intermediate forms.

**Archytas vulgaris** n. sp.

(Figs. 31, 32, 33)

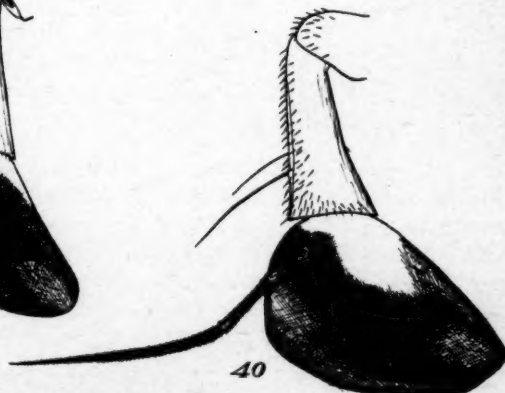
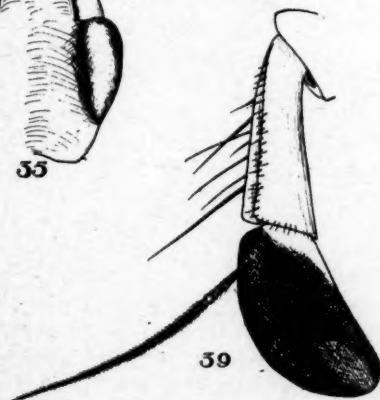
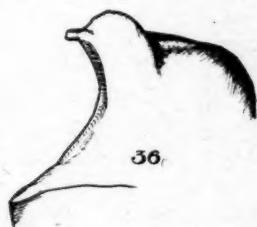
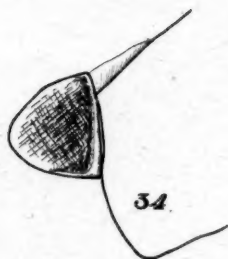
Length, 9.5 to 15 mm. *Male*. Frontal vitta pale orange. Face and cheeks silvery white, the pile whitish; front pale greyish yellow pollinose, the hair almost all yellowish. Occiput with yellow hair. Basal arista joint hardly twice as long as wide, the second joint three times as long as the first. Mesonotum yellowish grey pollinose; four posterior acrosticals. Disc of scutellum flat, yellowish brown in ground color, the margin reddish. Pollen on base of abdomen greyish, forming narrow fascia on second segment, the fourth segment tawny brown pollinose, the sides yellowish sericeous. Strong marginals on second segment. Halteres rusty reddish; squamae white.

*Female*. Basal arista joint not longer than wide; a few more black frontal hairs. Second abdominal segment normally without marginals.

This species most closely approaches *A. basifulva* Walk. and I at first took it to be the same, but the posterior arm of the fifth sternal lobe is shorter and broader and the ridges of the posterior forceps thicker, more widely separated (broadly concave between them) and their inner side bears long coarse pile. *A. vulgaris* is quite as common over its range as *A. apicifera* in the east, north and west and is represented by several hundred specimens.

*Holotype*—♂, Lawrence, Kansas, June 17, 1922 (Curran), No. 1434 in the Canadian National Collection.





*Allotype*—♀, same data.

Additional specimens—♂, Orillia, Ont., Sept. 8, 1925; 19 ♂ ♀, Springfield, Mo., July 16, 18, 1912 (H. H. Knight); ♂, Long Island, N. Y., Aug. 24, (Wm. T. Davis); ♂, ♀, Baton Range, La., ♀, Mound, La., Aug., (W. D. Reed); 2♂, N. Albany, Miss., Sept.; 2♂, Holly Springs, Miss., Aug.; 2♀, 2♂, Tupelo, Miss., Sept.; 2♀, Grenada, Miss., Sept.; ♂, Weilermann, Miss., April (J. L. E. Lauderdale) ex *Peridroma margaritosa*; ♀, St. Louis, Miss., Sept.; 2♀, Agric. College, Miss., Sept.; ♂, Charleston, Mo., June; 3♂, Raleigh, N. Carolina, July, (C. S. Brimley); ♂, Memphis, Tenn., Sept.; ♂, Madison, Wis., Sept.; 10♂, 20♀, Cherokee Co., Kansas, 1915 (R. H. Beamer); 2♂, 15♀, Bourbon Co., Kansas, 1915; 12♂, 7♀, Anderson Co., Kansas, 1915; 10♂, 10♀, Allen Co., Kansas, 1915; 12♂, 13♀, Johnson Co., Kansas, 1915; 3♂, 6♀, Labette Co., Kansas; 8♂, 18♀, Miami Co., Kansas, 1915; 5♂, 9♀, Neosho Co., Kansas, 1915; 3♂, 7♀, Butler Co., Kansas, 1916; 9♂, 2♀, Franklin Co., Kansas, 1915; 12♂, 11♀, Cowley Co., Kansas, 1916; 5♂, 5♀, Sumner Co., Kansas, 1916; 3♂, Harvey Co., Kansas, 1917; 1♂, Harper Co., Kansas, 1916; 2♂, 1♀, Montgomery Co., Kansas, 1916; 7♂, 3♀, Chautauqua Co., Kansas, 1916; 1♀, Atchison Co., Kansas, 1924; ♂ ♀, Barber Co., Kansas, 1916; ♂ ♀, Linn Co., Kansas, 1915; ♂ ♀, Wilson Co., Kansas, 1916; 2♀, Crawford Co., Kansas, 1915 (all R. H. Beamer); 1♀, Creeds Co., Colorado, 1914 (S. J. Hunter); 4♀, Clark Co., Kansas, May (F. S. Snow); 4♀, Leavenworth Co., Kansas, 1924 (E. P. Breakey); 1♂, Riley Co., Kansas, June (F. Marlatt); 4♂, 5♀, Phillips Co., Kansas, 1912 (F. X. Williams); 14♂, 12♀, Ellis Co., Kansas, 1912 (F. X. Williams); ♀, Allen Co., Kansas, 1915; 4♂, Labette Co., Kansas; 3♂, 2♀, Anderson Co., Kansas, 1915; 1♂, 6♀, Miami Co., Kansas, 1915; 9♂, 9♀, Johnson Co., Kansas, 1915 (all R. H. Beamer); 1♂, Kiowa Co., Kansas, 1923 (L. C. Woodruff); ♀, Montgomery Co., Kansas, 1916 (R. H. Beamer); ♀, Crawford Co., Kansas, 1915; ♂, Franklin Co., Kansas, 1915, 2♂, Bourbon Co., Kansas, 1915 (R. H. Beamer); 6♂, 4♀, Lawrence, Kansas, 1922 (C. H. Curran); ♂, Cowley Co., Kansas, 1916 (R. H. Beamer); ♂, ♀, Moss Pt., Miss., 1922; ♂, ♀, Agric. Coll., Miss., 1921 (F. M. Hull); ♂, Holly Springs, Miss., 1921; ♂, Memphis, Tenn., 1921; ♀, Douglas Co., Kansas, 1922 (W. J. Brown); ♂, ♀, Douglas Co., Kansas, Oct., (F. H. Snow); ♂, 2♀, Douglas Co., Kansas, 1919 (W. E. Hoffman); 6♂, 3♀, Russell Co., Kansas, 1912, 3♂, 4♀, Smith Co., Kansas, 1912, ♂, 4♀, Barton Co., Kansas, 1912, ♂, Meade Co., Kansas, 1911, ♂, Graham Co., Kansas, 1912, ♂, Rawlins Co., Kansas, 1915, ♂, ♀, Trego Co., Kansas, 1912, 3♂, 1♀, Osborne Co. Kansas, 1912, 2♂, Rooks Co., Kansas, 1912 (F. X. Williams); 1♀, Garden City, Kansas, 1895 (H. W. Menke); 2♀, near Landre, Wyoming, July (R. Moodie); 4♂, 1♀, Manitou Park, Colorado, July (F. H. Snow); ♀, Ithaca, N. Y., 1886 (A. M. Shaw); ♀, Beaver Co., Mont., 1913 (S. J. Hunter); 59♂, 92♀, Douglas Co., Kansas, 1919 (W. R. Hoffman); 5♀, Douglas Co., Kansas, 1914 (W. F. Brown); 27♂, 7♀, Douglas Co., Kansas, October (F. H. Snow); ♀, Lawrence, Kansas, 1914 (G. H. Vansell); ♀, Lawrence, Kansas (E. S. Tucker); 2♂, 2♀, Lawrence, Kansas, 1903; 5♀, Sugar Grove, Ohio; ♂ ♀, Lakeside, Ohio; ♂, Columbus, Ohio; 27♂ ♀, Washington Co., Ark., (D. G. Hall).

**Archytas lobulatus** n. sp.

(Figs. 34, 34a)

Length, 13 mm. *Male*. Front appearing greyish; frontal vitta orange, greatly narrowed above; frontal pollen greyish yellow; occipital pile white; a complete row of bristles outside the frontals. Third antennal segment brown, the base and lower portion reddish; the segment rather narrow, tapering from basal fourth, the apex broadly rounded; arista brown. Mesonotum yellowish grey pollinose, the vittae very inconspicuous; pleura more yellowish. Pleural pile wholly pale. Squamae white; halteres reddish with brown knob. Abdomen shining black, somewhat castaneous laterally and apically, the incisure between the first and second segments and apex of the first (from posterior view), whitish pollinose; fourth segment with silvery white pollen laterally and ventrally, the pollen dorsally inconspicuous and reddish in color.

Lobes of posterior forceps unusually high and short, thinned towards the margins; (figure 34 lateral view), the apex of the posterior forceps as in figure 34a. The inner lobes of the fifth sternite are united beneath with the apex of the lobe so that they do not form projecting finger-like processes, while there is a very short apical arm.

*Holotype*—♂, Chapada, Brazil, Nov., (Williston Collection), in the American Museum of Natural History, New York.

*Allotype*—♀, Yucatan, Mexico (Gaumer), in Kansas University Museum.

*Paratypes*—4 ♂, 36 ♀, Yucatan, Mexico, (Gaumer).

**Archytas dux** n. sp.

(Figs. 35, 36)

Length, 15 mm. *Male*. Parafrontal hair black; basal joint of arista not longer than wide; third antennal joint narrow, elongate, tapering from the arista, gently convex above, the lower edge straight. Front a little wider than eye. Palpi broadened apically. Mesonotum ochreous pollinose, with bronze reflection, the four vittae rather weak and narrow. Scutellum brownish red, paler apically, the pollen dense. Apical bristles decussate, broadly separated, a pair of bristles between and above them. Legs wholly black, the anterior femora greyish pollinose behind. Wings cinereous hyaline, broadly yellow at base, the sub-marginal cell of the same color as far as apex of first vein. Squamae white, with yellow border and fringe; halteres yellow. Abdomen shining black, the fourth segment rusty brown pollinose, but not conspicuously so on the disc. Outer forceps with two arms; posterior forceps broadly concave, the arm broad, tapering, notched at apex; from lateral view the ridges of the posterior forceps are much longer than wide. (See figs. 35 and 36).

*Female*. Differs in having wider front and the fourth abdominal segment yellowish white pollinose.

*Holotype*—♂, Ecuador (Parish) (Aldrich Collection), in United States National Museum.

*Allotype*—♀, Farm La Caja, San Jose, Costa Rica, April-June 1924.

*Paratypes*—2 ♂, 3 ♀, Farm La Caja, San Jose, Costa Rica, April-June

1924.

**Archytas vernalis n. sp.**

(Fig. 37)

Blackish or castaneous, the abdomen without pollen. Length, 14 to 15.5 mm.

*Male.* Cheeks, lateral third of parafacials, sides and lower third of facial depression and the parafrontals above, reddish, the head elsewhere black, cinereous pollinose, yellow haired, the front black haired on the upper third and with some coarse black hairs below; somewhat wider at the vertex than either eye. Frontal vitta brownish, seven to nine pairs of frontals, the upper two reclinate; three to five bristles in a second frontal row, the upper one proclinate, simulating an orbital; outer verticals long. The black occipital cilia extend to the lowest sixth of the eyes; cheeks with a few black bristly hairs, their width slightly greater than one-half the eye-height. Hair of parafacials rather fine. Palpi reddish, spatulate. Antennae reddish, the third segment mostly brown, slightly longer than the second, almost straight below, gently convex above, narrowed from the arista to the rounded apex; arista brown, the penultimate segment not twice as long as wide.

Thorax brownish, the mesonotum with metallic blue reflections, the humeri, lateral margins and scutellum reddish, the whole grayish pollinose, appearing thinly so above from dorsal view, the vittae fairly distinct. Pleura wholly pale haired, including the hair on the propleura.

Legs black; pulvilli yellow, moderately long.

Wings pale grayish, luteous basally; fourth vein bent at almost a right angle, with a conspicuous short fold. Squamae distinctly infuscated, somewhat yellowish.

Abdomen shining castaneous, except for the basal sternites, wholly black haired. Second segment with one pair of strong marginals, the third and fourth each with a row, the latter with two rows of discs on the apical half. Lobes of the fifth sternite separated by a broad V-shaped incision; posterior forceps without lateral ridges, the apex not upturned, the arms divided by a deep, rather wide incision; outer forceps composed of a single, tapering, inwardly curved arm.

*Female.* Front a little wider, with only a single bristle below outside the frontal row; with two pairs of strong proclinate orbitals.

*Type*—♂, Bartica District; *allotype*, ♀ and 2♂ *paratypes*, Savonilla, Colombia, July 25, 1902 (Capt. W. Robinson), ex *Megalopyga lanata*.

According to a label on one of the Colombian specimens this is *Archytas seminigra* Wied. of Coquillett, but it cannot be the species described by Wiedemann since it is very much larger and lacks pale pollen on the sides of the fourth abdominal segment.

**Archytas rufiventris n. sp.**

Head yellow, thorax and legs black; abdomen shining rusty reddish. Length, 15 mm.

*Male and Female.* Upper half of occiput black, densely yellow pollinose, the pile yellowish; parafrontals thickly brownish yellow pollinose; face and cheeks white. Hair of front black, of the parafacials and cheeks black and yellow intermixed, coarse. Palpi reddish. Antennae reddish, the third segment black except basally and ventrally, narrow, hardly as long as the second; arista brown, the penultimate segment about five times as long as wide.



Thorax with greyish ochreous pollen, the slender vittae fairly distinct; scutellum luteous. Pleural hair black; propleural pile yellow.

Wings pale brownish, reddish yellow at the base.

Abdomen dark rusty reddish, shining; first segment, a broad, incomplete median vitta on the second and sometimes the tip of the abdomen, black. Fourth segment dorsally with thin yellowish white pollen. Second segment with two or four bristles. Inner apices of the lobes of fifth sternite angular; outer forceps with two almost equal arms; posterior forceps almost as in *diaphana*.

*Holotype*—♂, Royal Palm Park, Fla., April 12-18, 1923, in American Museum of Natural History.

*Allotype*—♀, Miami, Fla., Nov. 12, (C. H. T. Townsend), in United States National Museum.

*Paratype*—♂, same data as holotype, No. 2821 in the Canadian National Collection, Ottawa.

The absence of pollen on the second and third abdominal segments as well as the shining dark reddish color will distinguish this species from *diaphana*.

There is a specimen from Mexico with the genitalia missing which has the parafacials and cheeks clothed with very fine yellow hair, darker antennae and infuscated squamae. It appears to represent an undescribed form.

### ***Archytas diaphana* Fabricius.**

(Figs. 38, 39)

*Tachina diaphana* Fabricius, *Syt. Antl.*, 308, 1805, Wiedemann, *Ausser. Zweifl.*, II, 281, 1830.

Rusty reddish, thorax and legs blackish; pleura wholly yellowish pilose. Length, 11 to 14 mm.

*Male and Female.* The description of *willistoni* Curran fits this species with the following exception: the antennae are smaller, the third segment narrow; posterior forceps longer and less deeply notched.

Several specimens of both sexes from Brazil, British Guiana, Panama and Costa Rica.

### ***Archytas willistoni* Curran.**

(Fig. 40)

*A. willistoni* Curran, *Amer. Mus. Novitates*, No. 176, 9, 1925.

Color as in *A. diaphana* Fabricius, but the antennae are much larger, the palpi filiform, not broadened apically, and the posterior genital forceps shorter and much more deeply notched at the tip. Length, 11 to 12.5 mm.

*Male.* Front one-fifth wider than eye; eyes bare; ocellar bristles wanting. Head yellowish pollinose, the face and cheeks with more whitish pollen; front darker in ground color; several orbital bristles, the number not constant; the hairs of the front black; the black occipital cilia extend to the lower fifth of the eyes. Pile of the face, cheeks and occiput, yellow. Palpi yellow, slender to the tip. Antennae reddish, the third joint brownish on the outer surface, large, sub-triangular; upper surface broadly rounded, apex oblique, straight, the lower corner rather sharply rounded; arista brown, the basal segment almost three times as long as wide and but little shorter than the penultimate segment.

Thorax dark in ground color, the humeri, lateral margins and scutellum yellowish, the whole clothed with brassy grayish yellow pollen, leaving four slender darker vittae, which are interrupted at the suture. Four posterior dorso-central; three sternopleurals. Scutellum with four pairs of marginals, the alternate pairs weak, the apical pair decussate; one pair of strong pre-apical discals and a weaker pair between and slightly in front of them.

Legs black; coxae and trochanters largely reddish yellow; the tibiae obscurely reddish.

Wings slightly infuscated, yellow basally; angle of the fourth vein with an indication of an appendage; posterior crossvein oblique, gently curved, joining the fourth vein at the apical three-fourths of its penultimate section. Squamae white, their border and the halteres yellowish.

Abdomen rusty reddish yellow; a small spot beneath the scutellum, a small brownish apical triangle on the second segment and apices of the third and fourth segments slightly infuscated, the fourth whitish pollinose, the bases of the two preceding segments narrowly so. Hair of the abdomen black; yellow on the under side of the first three segments; each sternite, except sometimes the first, with two to eight black bristles apically. Second tergite normally with two median marginals.

*Female.* Differs in having slightly wider front and much smaller third antennal joint, this being only gently widened to the apical third; the apex oblique but gently convex.

Described from three males and four females, from Brazil; one female from Corumba, Mat. Grosso, December 14 to 23, 1919, (R. G. Harris), the remainder from Chapada, (Williston Collection). Types in The American Museum of Natural History.

#### EXPLANATION OF PLATES

- Figure 1.—*Jurinia metallica* Desv.—Posterior and outer forceps.  
 Figure 2.—*Jurinia nitidiventris* n. sp.—Posterior forceps.  
 Figure 3.—*Jurinia nitidiventris* n. sp.—Antenna of ♂.  
 Figure 4.—*Archytas pilosa* Drury.—Antennae of ♂.  
 Figure 5.—*Archytas daemon* Fabr.—Antenna of ♂.  
 Figure 6.—*Archytas antillicola* Curran.—Head of ♂.  
 Figure 7.—*Archytas unguis* Tns.—Posterior forceps.  
 Figure 8.—*Archytas unguis* Tns.—Anterior of ♂.  
 Figure 9.—*Archytas townsendi* n. sp.—Posterior and outer forceps.  
 Figure 10.—*Archytas vexor* n. sp.—Posterior and outer forceps.  
 Figure 11.—*Archytas chilensis* n. sp.—Posterior and outer forceps.  
 Figure 12.—*Archytas aterrima* Desv.—Posterior and outer forceps.  
 Figure 13.—*Archytas instabilis* n. sp.—Posterior and outer forceps.  
 Figure 14.—*Archytas lateralis* Macq.—Posterior and outer forceps.  
 Figure 15.—*Archytas lateralis* Macq.—Lobes of fifth sternite of ♂.  
 Figure 16.—*Archytas sibilans* Curran.—Lobes of fifth sternite of ♂.  
 Figure 17.—*Archytas peruanus* n. sp.—Posterior and outer forceps and penis.  
 Figure 18.—*Archytas peruanus* n. sp.—Apical section of penis, lateral view.  
 Figure 19.—*Archytas palliata* n. sp.—Posterior and outer forceps.  
 Figure 20.—*Archytas pollinosa* n. sp.—Posterior and outer forceps.  
 Figure 21.—*Archytas varicornis* n. sp.—Lobe of fifth sternite.  
 Figure 22.—*Archytas apicifera* Walker.—Posterior and outer forceps.  
 Figure 23.—*Archytas apicifera* Walker.—Lateral view of apical section of penis.  
 Figure 24.—*Archytas nivalis* n. sp.—Apical arm of posterior forceps.  
 Figure 25.—*Archytas nivalis* n. sp.—Lateral view of apical section of penis.  
 Figure 26.—*Archytas cirphis* Curran.—Posterior and outer forceps.  
 Figure 27.—*Archytas plangens* n. sp.—Apical arm of posterior forceps and outer forceps.  
 Figure 28.—*Archytas incasana* Townsend.—Apical arm of posterior forceps.  
 Figure 28a.—*Archytas prudens* n. sp.—Lobe of fifth sternite.  
 Figure 29.—*Archytas basifulva* Walker.—Posterior and outer forceps.  
 Figure 30.—*Archytas basifulva* Walker.—Lateral view of lobe of posterior forceps.  
 Figure 31.—*Archytas vulgaris* n. sp.—Posterior and outer forceps.  
 Figure 32.—*Archytas vulgaris* n. sp.—Lobe of fifth sternite.  
 Figure 33.—*Archytas vulgaris* n. sp.—Lateral view of apical section of penis.  
 Figure 34.—*Archytas lobulatus* n. sp.—Lateral view of lobe of posterior forceps.  
 Figure 34a.—*Archytas lobulatus* n. sp.—Apical half of posterior forceps.  
 Figure 35.—*Archytas dux* n. sp.—Posterior and outer forceps.  
 Figure 36.—*Archytas dux* n. sp.—Lobe of fifth sternite.  
 Figure 37.—*Archytas vernalis* Curran.—Posterior and outer forceps.  
 Figure 38.—*Archytas diaphana* F.—Posterior and outer forceps.  
 Figure 39.—*Archytas diaphana* F.—Antenna.  
 Figure 40.—*Archytas willistoni* Curran.—Antenna.

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